Teaching Case

Setting the Scene: Constructing Scenario-Based Dioramas to Minimize IS Developer Biases

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Abstract

Self design, the tendency for system developers to supplant user requirements and needs by overestimating their own experiences and preferences, presents a threat to the ability to successfully deliver functional systems which truly provide value to end users. This Teaching Case elaborates on the dangers of self design, establishes a need for addressing this in IS education, and then presents a hands-on, in-class activity about building physical dioramas to both highlight that bias for students while also giving them practice with a key user-centered design activity which, among others, may help to minimize the risks of such biases. This work also includes suggestions, based on the author's experiences, for IS education at-large.

Keywords: User Scenarios, User-Centered Design, Systems Analysis and Design, Constructionism, Active Learning, IS Education

1. INTRODUCTION

Today, nearly every company has a website, mobile app, or device connected to the Internet of Things; therefore, understanding the needs and expectations of target users is key to success. The following vignettes illustrate three examples.

A new web app will help users find healthy recipes based on available ingredients. The developers have identified John as an archetype of their anticipated users. As an Information Systems (IS) grad student who aims to work in tech consulting, his lifestyle and budget suggest he'd benefit from simple, nutritious, and inexpensive recipes.

Anna has a much in common with John. She's also an IS grad student with aspirations of becoming a freelance developer. A local start-up connecting renters with subletters has identified her as a model user of their app because Anna exemplifies their expected clientele's demographic and behavioral profile.

John and Anna are probably both acquaintances with Noah, who is working on his MBA at the same university. Noah hopes to become a systems analyst, but in the meantime, he's been chosen by a literacy non-profit as the primary persona for their new web portal that helps users trade books.

Despite covering varied and distinct uses, the above products have profiled individuals with notably overlapping characteristics. Accordingly, one might suspect such profiles were conceived of by students in an IS grad class, as they suggest "self-design" (Spool, 2009) whereby developers overestimate the extent to which stakeholders share commonalities with them. This bias may mean developers overrepresent their knowledge and skillsets during systems analysis and design, resulting in a system more useful to them than to stakeholders.

Because students tend to be inexperienced with system development, they may be particularly vulnerable to self-design once they begin professional work. I maintain that recognition of self design and practice with User-Centered Design (UCD) techniques has potential to mitigate that vulnerability. Therefore, *the goal of this paper is to describe an exercise for IS students to (1) recognize self design bias through collaboratively constructing an artifact, and (2) understand the extent to which such activities may or may not facilitate moving beyond such bias.*

2. BACKGROUND

Recent curriculum guidelines for IS recognize that students need competency with "analytical techniques to develop the correct definition of business problems and user requirements." (Leidig and Salmela, 2020, p. 55). Those "correct definitions" are the heart of the Analysis phase of the System Development Lifecycle (SDLC) whereby developers are focused on techniques to derive and document proper requirements; while also central to the Design phase whereby solutions are built for how the system shall address requirements.

The Problem of Self Design
Too often, solutions embodied in a newly-developed system fail to meet user needs. Rosson and Carrol (2002) reason that this is because, first, system development tends to be problem-oriented, encouraging *developers* (a term used here for simplicity, as named roles may vary) to commit prematurely to their first viable solution. Second, developers tend to reuse frameworks already familiar to them when designing system solutions. Finally, solutions get decontextualized when there's too much focus on functional requirements, leading to discrepancies in how the system is used in the real-world by actual users.

The above suggests, at least in part, self design, and is exacerbated by the fact that most development professionals vary considerably in knowledge and expectations of technologies. Therefore, when a system is designed largely from their perspective, it may "not be suitable for most of its users" (de Voil, 2020, p. 23).

While there is not one unanimously agreed-upon, consistently-used academic or professional SDLC approach (Darrin and Devereux, 2017), self design is a persistent, irrespective threat. Therefore, IS educators have a duty to design instruction to call out, address, and teach techniques that minimize this bias. User-Centered Design (UCD) can be a powerful methodology toward this end as, broadly, it prioritizes empathy for users, their needs, and their expectations (Steinke, Al-Deen, & LaBrie, 2017). Such suggests that integrating UCD techniques in IS education may help students gain competency with addressing "the correct definitions" of requirements that include usable solutions that are actually useful to users in the real-world

User-Centered Design
Although guidelines for IS curriculum touch on UCD, they do so only in regard to user-interface (UI) design (Leidig and Salmela, 2020). The term UCD was coined in 1980 (Abras, Maloney-Krichmar, & Preece, 2004) to advocate for "aligning the design with users' expectations and goals" as opposed to assumptions and experiences of developers (Hasani, Sensuse, & Suryono, 2020, p. 1). Beyond UI design, UCD is a methodology for designing entire solutions via explicit understandings of users, their tasks, and their context by involving them throughout development and evaluation of solutions (de Voil, 2020). Despite there being ample research suggesting that UCD methods be applied to product development, too often it is not (Ardito, Buono, Caivano, Costabile, & Lanzilotti, 2014).

Like the SDLC, there are varied definitions and conceptualizations of specific steps/activities in UCD. Still, there are two common techniques, user personas and user scenarios, which may help minimize self design while learning to practice system analysis (understanding the problem) and design (creating a solution).

User Personas and User Scenarios
Personas are documented, fictional, but realistic and representative archetypes of potential or actual users (Minichiello, Hood, & Harkness, 2018) intended to prioritize user group(s) over developers. While these should be documented through actual research, too often, organizations invent simple "bullshit personas" (de Voil, 2020) that reinforce self design.

Scenarios are written vignettes that compliment personas, placing them in context by describing how a person (the aforementioned persona) can use the system to achieve their relevant goals or tasks (Minichiello et al. 2018). They are "narrative descriptions of envisioned usage episodes… employed in a variety of ways to guide the development of the system that will enable these use experiences" (Rosson and Carroll, 2002, p. 1032). The idea is to clearly define a problem space while also presenting a solution. In this way, a solution is assumed for the problem, but

is not described in detail. Such intentional ambiguity allows flexibility so design solutions can be altered or deferred instead of prematurely accepted following the first viable instantiation.

As a point of reference, an example user scenario follows, written for an undergrad archetype utilizing a local transportation webapp:

Suzy McStudent is running late for class (again) and grabs her phone as she walks out of her apartment building. Suzy pulls up SchoolRides to see which transportation options are available to get to campus as quickly as possible. She finds that most options will get her there after class starts, but that a bike share station around the corner may allow her to arrive on time if she hurries. A few minutes later, Suzy is peddling fast and easily navigating the morning traffic.

In the above, the solution is presented together with the problem; but minimal details about the solution's design (such as what the webapp looks like, how it functions, or which other transportation options are available to Suzy) are addressed. In this way, scenarios are more solution-oriented than problem-oriented.

User scenarios, and by inclusion, personas, improve a team's understanding of, and sense of empathy toward, the actual users for whom they're designing, developing, and implementing solutions (de Voil, 2020). Given this, it is beneficial for students to be gain experience with them and recognize how they ward against bias. While little has been written about how to teach scenarios, and some discrepancies exist about which attributes to include in one, Gkikas, Nathanael, & Marmara (2017), assert that a successful scenario should be "clearly written through the eyes of a particular user group the students did not belong to" (p. 173).

Why a Diorama Exercise?
To address the self design, I devised the following exercise whereby student teams would construct 3-dimensional (3D) dioramas. The following detail about the exercise should help others determine its applicability for their classrooms.

3. THE DIORAMA EXERCISE

This exercise was developed in the business school of a large, well-known United States university for a graduate MIS capstone course. In 2021, the course's professor-of-record shifted to a new instructor who is also the author of this paper. Like previous terms, student groups (teams of 4 or 5) would apply knowledge and skills from across their coursework in a semester-long project. As a new approach, the project goal was to develop a web-based system that fulfills one or more needs common to collegiate students. UCD techniques were integrated to teach self design avoidance.

Projects included, for example, local ride-sharing apps, online used-good marketplaces, food and shelter locators, volunteer-organizing boards, and GPA calculator, among others. The prompt of addressing a "student-problem" was derived so learners could apply UCD techniques with minimal barriers, like conducting user research on their own campus.

The first semester I taught this course, teams identified problem-domains that were general to college students. Yet, their user research was mostly conducted with MIS graduate students, MIS undergraduate students, or other business graduate students; leading, invariably, to user personas and scenarios reflecting a primary user base overly-similar to the teams themselves. Self design was prevalent despite the UCD techniques.

The next term, I more rigorously stressed self-design avoidance. While this yielded slightly more varied research (diverse majors and levels of study), personas still dominantly portrayed the user archetype of MIS graduate students. As a response to this, I created the Diorama Exercise as a way to spotlight and discuss self-design tendencies with the class.

The exercise has now been implemented and refined across two semesters, comprising a total of five separate cohorts each with 7 to 8 teams; meaning approximately 35-40 teams in total have thus far participated. An amalgamation of these instances informs the instructions below.

Why Dioramas?
Scenarios are typically written. In a team setting, it is likely only one student would do the writing, resulting in an imbalance of engagement (even if everyone provided input). Having groups work together to create a physical 3D diorama draws on the philosophy of Constructionism (derived from Constructivism), which posits that when students construct artifacts, the act of creating fosters deeper engagement with course concepts, yielding a meaningful learning experience (Papret, 1991). Further, doing this as a team helps the experience be more evenly-distributed where everyone participates socially in a hands-on fashion.

Per the Cambridge Dictionary, diorama is defined as a 3D "model that that shows a situation, such as a historical event or animals in their natural environment" (dictionary.cambridge.org), often done in miniature. As dioramas depict a situation or event with modeled detail, there is a sense of context embedded in them; thereby being a strong analog for scenarios. That is, the fidelity of an event, like an archetype using a system to complete as task, is commensurate even if the medium is notably different.

Diorama Materials
In the most recent term teaching the course, for 114 students (3 classes total, each with 7 or 8 teams), the following materials (samples depicted in Figure 1), were sufficient:
- Mailing boxes (approximately shoe-box size, x25)
- 9x12 construction paper (x240 in various colors)
- 8.5x11 in printer paper (x50 sheets)
- Specialty paper (metallic or photo-background – approximately x50 sheets)
- Sticky notes of various colors (x100 in various colors)
- Index cards (x100)
- Various-sized sticky labels (x100)
- No. 2 pencils with erasers (x20)
- Extra erasers (x10)
- Colored pencils (x2 packs of 72)
- Color markers (x2 packs of
- Scotch tape (x8 rolls)
- Glue sticks (x16 sticks)
- Activity glue (x8 bottles)
- Scissors (x8)
- Rubber bands (various sizes, x2 bags)
- Miscellaneous extras as available (such as "googly" eyes, pipe cleaners, fake money, toothpicks, wooden cutouts, glitter, etc.)

Figure 1: Diorama Materials

Exercise Direction
Prior to the exercise, students conducted some user research and worked on a draft of their first user personas. They have read about scenarios but not yet written (or discussed) any as a team.

At the start of the class where the exercise is conducted, I show sample dioramas (mostly themed as book reports from elementary or middle school students), explaining how they capture event details (like memorable scenes from a book). The analogy is then made to user scenarios, reiterating that scenarios depict scenes of users in context engaging with a solution to achieve a goal. Scenarios as tools to understand user needs, motivations, barriers, and more are emphasized across this 10-minute preface.

Students are then asked, as a team, to write out a user scenario on a note card and then build a diorama that illustrates it, including:
- Your primary persona utilizing your website
- The device(s) being utilized
- The physical environment of use
- Any additional details that help capture important storytelling elements (such as about the persona's personality, details of the physical environment, etc.)

Figure 2: Diorama Exercise (5 minutes in)

Figure 3: Diorama Exercise (2 minutes left)
Teams are limited to one pair of scissors and one mailing box, but are otherwise not directed to use or avoid any specific material. While they were encouraged to be creative, they were asked not use more than what was needed. Teams were allotted 50 minutes (in a 1 hour and 15-minute class) to work as illustrated in Figures 2 and 3.

Diorama Outcomes
The finished diorama demonstrates: (1) the extent to which self design was evident, and (2) the extent to which team members comprehend the scope and purpose of a user scenario. In respect to the former, self design was still evident. For example, Figure A3 in Appendix A shows a persona whose age strongly suggests they are a graduate student (despite the university having vastly larger undergraduate population); while another (seen in Figure A4) depicts the persona as a student in the Business School despite the product being applicable across disciplines.

As for scope and purpose, about half of the teams seemed to have a fair or good understanding of scenarios as depictions of a user's context with a rough notion of how a solution helps in a particular problem moment (for examples, see Figures A1-A3). Yet, some missteps were still identified such as: (1) overemphasis on defining the persona (Figure A4), (2) overly-specific design solutions (Figure A3), (3) scenarios as too problem-centric (Figure A5), and (4) scenarios as advertisements for product utility (Figure A6). Further, some teams demonstrated little to no understanding of scenarios, taking the instructions solely at face value (Figure A7).

These outcomes then become the focus of a 20-30 minute discussion in the following class where photos of the dioramas are shown to facilitate a discussion aimed at highlighting student self-design tendencies and misinterpretations of scenario purpose and scope.

Diorama Discussion
Facilitating class-wide discussions following an activity not only allows the instructor to gain feedback about the success of the activity from those it was intended for, but it can assist the students in better comprehending the subject matter at the heart of the activity. This follows a Collaborative Constructivist perspective, which maintains that individual knowledge is inherently a socially-built artifact (Brown, 2006; Brown & Thomas, 2010; Dewey, 1938; Garrison, 2011; Garrison, Anderson, & Archer, 2000). In other words, social experiences (such as the exercise itself and the subsequent discussion) help students establish meaning and gain value from a lesson.

The discussion revealed that ongoing self design had two main causes. First, while students learned about UCD and were warned against self design, they didn't believe that the bias was an actual problem since they were students developing a product for other students. Therefore, the relevance of seeking diverse backgrounds within the group "students" tended to fall flat.

Second, students had a lack of social agility. They were generally fine approaching others in the business school to conduct user research, but were far less comfortable and confident doing so elsewhere on campus.

The discussion also yielded some insight on scenario scope and purpose. Exacerbated by the perennial problem of "nobody actually does the reading", too many students thought that scenarios were intended to advertise a product's utility. While they largely included environmental and situational factors (like which sorts of settings, and on which types of devices, their websites might be needed), such were sometimes depicted similar to a marketing campaign where product utility was emphasized over the problem.

Closely related to this, some students believed that scenarios should include the solution in detail as some groups included specific, detailed website user-interfaces in their dioramas to show how it would work. They did not fully understand why solutions should include only rough detail with minimal specificity about the design solution. In short, they were prioritizing the problem by coalescing around an immediate and detailed solution. This evidenced a further lack of buy-in on self design as problematic.

Despite these persistent issues, the discussion session helped students to recognize missteps and knowledge gaps, while also giving the instructor space to adjust and recalibrate. For example, the instructor brought in more examples of user scenarios, and encouraged further user research that better varied in terms of demographics. Ultimately, several course projects still concluded with self-design tendencies, but their prevalence was moderately diminished. Most groups included a secondary (or alternative primary) persona representing a more diverse archetype, higher-quality scenarios (that were solution-oriented with a minimal degree of fidelity), and conducted testing of their websites by including a range of student majors outside of the business school.

4. DISCUSSION

The purpose of this exercise was twofold: in that students both recognize self design and understand how techniques like scenarios might help reduce bias. Accordingly, I present recommendations for IS education based on my experience with the Diorama Exercise, and then make suggestions about how other might consider integrating this or similar exercises in their classroom.

Recommendations for IS Education
Students should receive coaching on, and practice with gathering requirements (including preferably, conducting user research) with diverse individuals. Post-exercise conversations suggested many students are uncomfortable with engaging others who do not have a common background. As professional workplaces tend to be heterogeneous, students need more experience and confidence in engaging with others who have different backgrounds. While IS programs often teach techniques for eliciting requirements, we should add lessons on how to approach and engage diverse stakeholders; perhaps even implementing projects that require students to do so.

Perhaps the link between self design and misaligned or improper requirements cannot be truly appreciated until one experiences it first-hand. Therefore, IS coursework should address the self design problem early and often. This may take the form of reviewing and discussing case studies about failed projects into coursework, or other exercises which demonstrate the blindness and bias inherent in self design to better impress this upon our students. This, I suspect, will continue to be a great challenge.

We need to do a better job of recognizing and developing empathy in courses. This recommendation is not necessarily new, but has renewed urgency based on my recent experience. Students tend to want to know the one best way of doing something (given the perception that mastering "the right way" yields the highest grade), which leads to myopic problem-solving approaches (such as adopting the first viable design that works for them). Users, who again, are typically not like developers, are the ones who ultimately derive value from an information system, so it is critical that IS professionals empathize with their users for the ultimate good of stakeholders and project success.

Teaching Tips for Others
For those who might conduct a similar exercise in their own classroom, here I make some suggestions for replication or adaptation based on two themes: materials and context.

Materials Suggested
The materials provided (and quantity thereof) can be flexible. While I provided an approximation of items and quantities that were sufficient, such should be considered in respect to available resources (money and time). There did not seem to be a rule of thumb identified in respect to the materials that teams found most beneficial for constructing their dioramas, other than that a sturdy base and walls (usually cardboard or specialty paper) around which to anchor objects was a necessity. While I wanted to have as many materials as possible to foster creativity, I found several teams incorporated as many materials as possible into their dioramas just because they could.

As a best practice, I suggest instructors assess which materials are most viable for them (perhaps simply already accessible office supplies), or consider giving students this exercise to do outside of the classroom as a homework assignment. Such may encourage more resourcefulness on the student side, and also free up class time for important discussions about self design and scenario purpose and scope.

Another alternative suggestion is that this exercise might be done digitally by, for example, requiring students to create a virtual (more 2-dimensional) scene or collage using PowerPoint or Canva. Despite my belief that a hands-on, constructionist activity is impactful and memorable, virtual options could prove more practical and affordable while yielding similar outcomes.

Context Suggestions
As noted, I implemented the diorama exercise in an IS Capstone course. And while this still is, conceptually, a good fit for this type of activity, it might also have fit for other courses.

For example, most IS programs have a course in Systems Analysis and Design, which focuses on understanding business problems and user needs. An exercise like this, and by extension, more UCD-oriented exercises, might impress upon students the threat of self design even earlier in their curriculum. An exercise like this may also be applicable to courses in Human-Computer Interaction as these tend to be design-oriented, whereby the user's context and tasks are key points of discussion.

Outside of IS, in Computer Science, the subject of Software Engineering is a prime candidate for an exercise like this as the lifecycle of software is the focus. They also address requirements engineering (Sommerville, 2016), like Systems Analysis and Design, but with more of an emphasis (and rightly so) on software. Such might help future engineering professionals reduce the risk of bias in their products.

Finally, regardless of the class this or a similar exercise is administered in, I suggest that the instructor be hands-off while the exercise is conducted. Certainly, the instructor's presence is crucial to for responding to practical questions (such as, "are we allowed to use this", "where can I find that", or "how much time is left"), but otherwise, if the instructor is freed up to make observations as students engage in the process of completing the exercise, that can lead to a better understanding of students' grasp of scenarios and self-design avoidance, thereby supporting a stronger and more fruitful class-wide discussion.

5. CONCLUSION

I began this paper by presenting profile vignettes which were obvious in their homogeneity, and consistent with the types of profiling I've seen graduate students depict in their capstone IS course. That is, they have demonstrated an ongoing affinity for self design, which is problematic as this is their final course before entering the workforce.

Accordingly, this paper presented an argument for intentionally recognizing and avoiding self design through an exercise meant to recognize and defend against it. In doing so, I also discussed larger implications I've learned for IS education. It is my hope that readers will feel compelled to similarly scrutinize the extent to which self design is present in their own class projects, and consider creating educational experiences that promote user-centered techniques as a proactive measure to reduce bias.

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7. APPENDICES
Appendix A: Examples of Scenario Dioramas
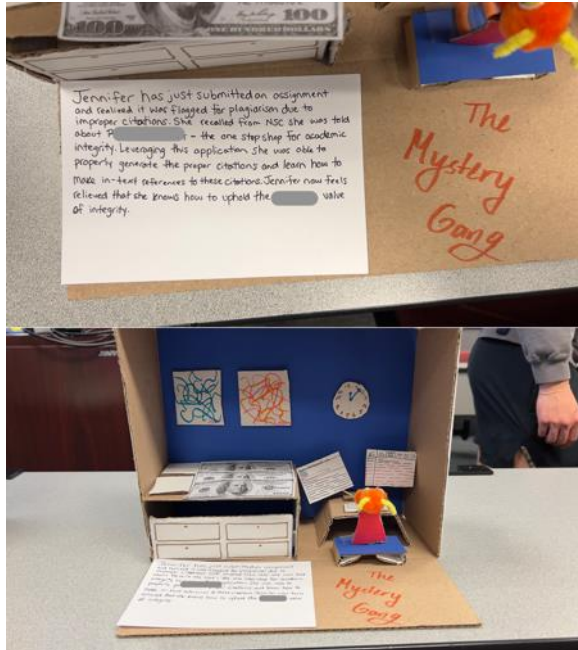
Figure A1: Artifact illustrating strong understanding of User Scenarios

Scenario: Jennifer has just submitted an assignment and realized it was flagged for plagiarism due to improper citations. She recalled from NSC she was told about [REDACTED] – the one stop shop for academic integrity. Leveraging this application she was able to properly generate the proper citations and learn how to make in-text references to these citations. Jennifer now feel relieved that she knows how to uphold the [REDACTED] value of integrity.

Diorama: depicts student at work in, presumably a dorm room with money on a bed (or dresser) for some unknown reason
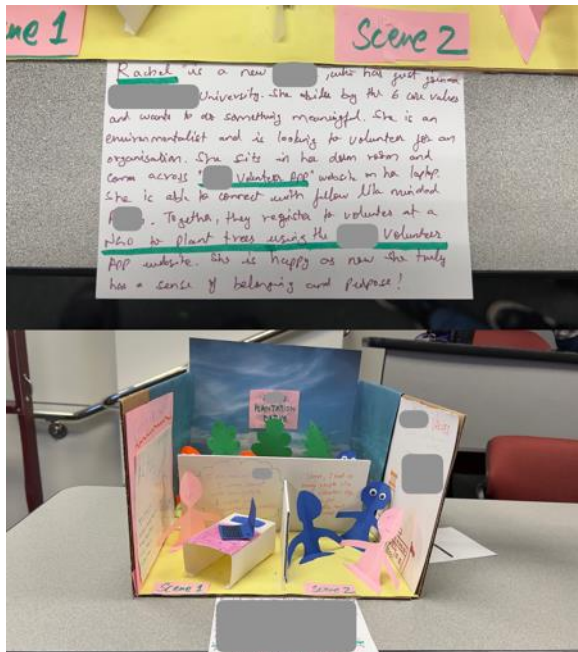
Figure A2: Artifact illustrating a strong understanding of Scenarios, but with two scenes.

Scenario: Rachel is a new [REDACTED] who has just joined [REDACTED] University. She abides by the 6 core values and wants to do something meaningful. She is an environmentalist and is looking to volunteer for an organization. She sits in her dorm room and comes across "[REDACTED] volunteer app" website on her laptop. She is able to connect with fellow like minded [REDACTED]. Together, they register to volunteer at a NGO to plant trees using the [REDACTED] volunteer app website. She is happy as now she truly has a sense of belong and purpose.

Diorama: Depicts two scenes, actually, with the persona as the main character in each – first in her room and then at the event.
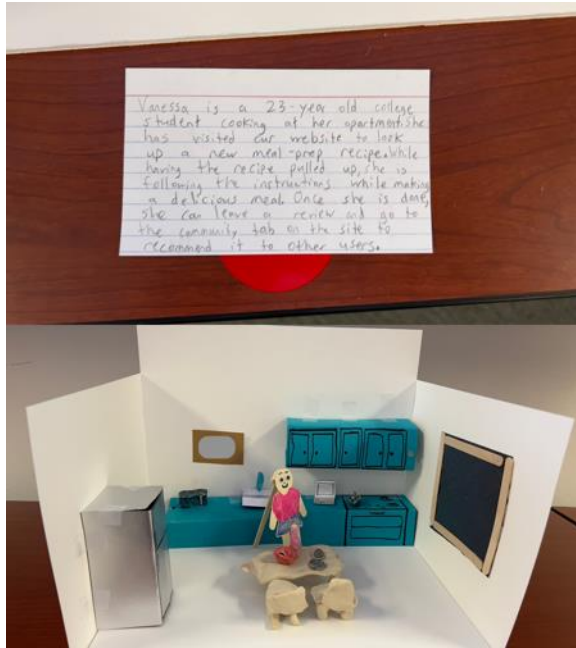
Figure A3: Artifact illustrating a good understanding of Scenarios but includes over-descriptive narrative and a suggestion of self design

Scenario: Vanessa is a 23-year old college student cooking at her apartment. She has visited our website to look up a new meal-prep recipe. While having the recipe pulled up, she is following the instructions while making a delicious meal. Once she is done, she can leave a review and go to the community tab on the site to recommend it to other users.

Diorama: This is a great contextual representation of Vanessa in her kitchen performing a task. However, the mention of the "community tab" is a bit too specific for a scenario. Additionally, her age suggest she is likely a graduate student, just like those who are developing this web app.
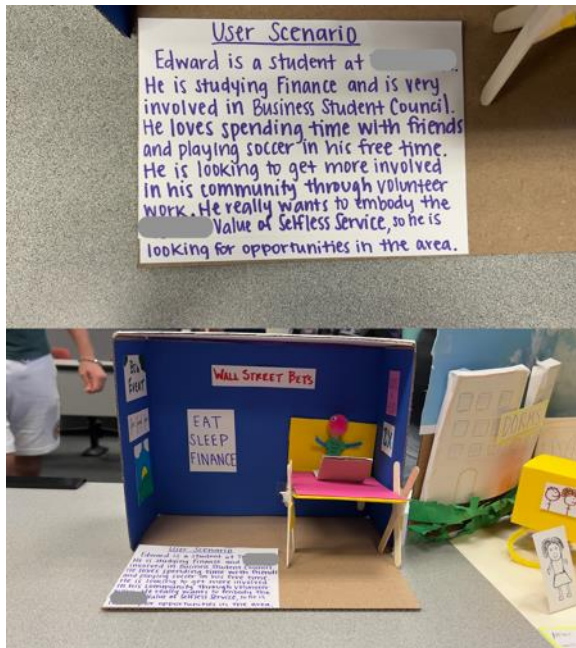
Figure A4: Artifact illustrating a weak understanding of Scenarios and is demonstrative of self design

Scenario: Edward is a student at [REDACTED]. He is studying Finance and is very involved in Business Student Council. He loves spending time with friends and playing soccer in his free time. He is looking to get more involved in his community through volunteer work. He really wants to embody the [REDACTED] value of selfless service, so he is looking for opportunities in the area.

Diorama: It depicts a scene with context, but does not clearly include the product being developed to assist with the goals stated in the scenario. Rather, the description is focused exclusively on the persona.
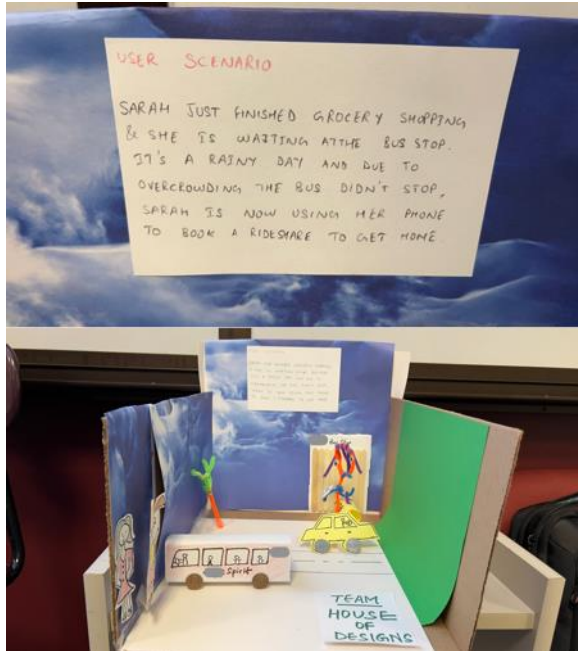
Figure A5: Artifact misunderstanding scenarios as problem-oriented

Scenario: Sarah just finished grocery shopping & she is waiting at the bus stop. It's a rainy day and due to the overcrowding the bus didn't stop. Sarah is now using her phone to book a rideshare to get home.

Diorama: The write-up for the scene spells out what the problem is, but doesn't include a clear goal nor a mention of the solution short of it generally being a mobile ride-share.
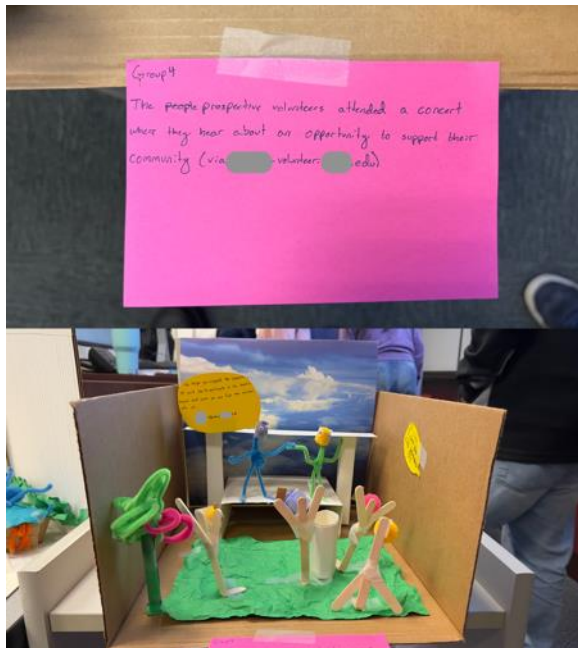
Figure A6: Artifact misunderstanding scenarios as a general advertisement of system utility

Scenario: The prospective volunteers attend a concert where they hear about an opportunity to support their community (via [REDACTED WEB SITE ADDRESS])

Diorama: There is no persona present, nor is there any suggestion about which type of device(s) support the website. The scene is context-heavy as an outdoor concert with a performer explaining that others can volunteer using the website in question.

Figure A7: Artifact showing little more than surface understanding of scenarios

Scenario:
- Primary Persona: Maroon Martin who is a new student [REDACTED] still in his initial days
- Devices Used: Laptop
- Physical Env: Flags indicating diversity, piano for soothing music, sofa to make student feel comfortable
- Environment: Flag room

Diorama: Unfortunately for this team, it fell apart prior to photographing it. While it did contain the items and persona referenced in their scenario card, there is no coherent application of their website to the scenario. There is no indication about what sorts of goals or tasks they help users achieve